

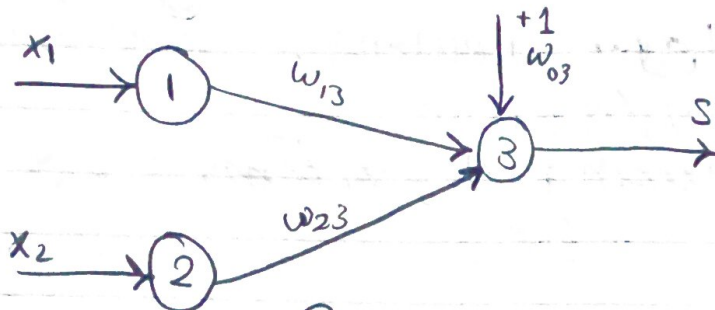
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السبت

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الأسبوع 1

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\* Activation Function (threshold function)

$$S = \begin{cases} 1 & y \geq 0 \\ 0 & y < 0 \end{cases}$$

$$w_{13} = 2, \quad w_{23} = 2, \quad w_{03} = -1.5$$

$$\textcircled{1} \quad x_1 = x_2 = 0$$

$$y = x_1 w_{13} + x_2 w_{23} + w_{03}$$

$$= 2x_1 + 2x_2 - 1.5$$

$$= -1.5 < 0 \Rightarrow \boxed{S = 0}$$

$$\textcircled{2} \quad x_1 = 0; \quad x_2 = 1$$

$$y = (2)(0) + (2)(1) - 1.5$$

$$= 0.5 > 0 \Rightarrow \boxed{S = 1}$$

OR

input		output
$x_1$	$x_2$	$S$
0	0	0
0	1	1
1	0	1
1	1	1

$$\textcircled{3} \quad x_1 = 1; \quad x_2 = 0$$

$$y = 0.5 \Rightarrow \boxed{S = 1}$$

$$\textcircled{4} \quad x_1 = x_2 = 1$$

$$y = 2.5 \Rightarrow \boxed{S = 1}$$

1

Design ANN:-

- ① i/p , o/p
- ② Linearity? (determine hidden Layer)
- ③ no. of Hidden Layer neurons.
- ④ Activation function/neuron
- ⑤ weights  $\leftarrow$  Learning Algorithms

Design OR

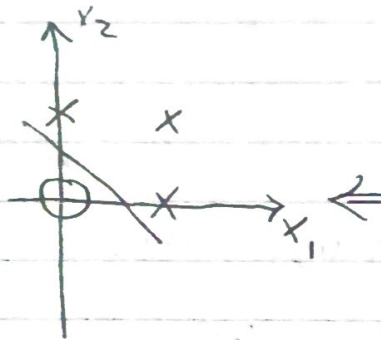
- ① i/p = 2      o/p = 2

- ② "Linear"

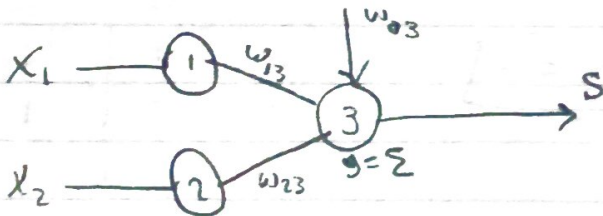
use no hidden layers

- ③ 1 neuron

- ④ Threshold function



$x_1$	$x_2$	$s$	
0	0	0	0
0	1	1	X
1	0	1	X
1	1	1	X



$$y = w_{13}x_1 + w_{23}x_2 + w_{03}$$

$$\textcircled{1} \quad x_1 = 0, \quad x_2 = 0 \rightarrow s = 0$$

$$y = w_{03} < 0$$

$$w_{03} = -A \quad (A \text{ is Positive})$$

$$\textcircled{2} \quad x_1 = 0, \quad x_2 = 1 \rightarrow s = 1$$

$$y = w_{23} + w_{03} > 0$$

$$\Rightarrow w_{23} > A$$

$$\boxed{3} \quad x_1 = 1 \quad x_2 = 0 \rightarrow S = 1$$

$$y = w_{13} + w_{03} > 0$$

$$w_{13} > A$$

$$\boxed{4} \quad x_1 = 1 \quad x_2 = 1$$

$$y = w_{13} + w_{23} + w_{03} > 0$$

$$w_{13} + w_{23} > A$$

So, we can put  $w_{13} = 12$ ;  $w_{23} = 11$   
 $w_{03} = -10$

For AND; follow the same steps but change weights

$$w_{03} = -10, \quad w_{13} = 3, \quad w_{23} = 8$$

$$y = w_{13} + w_{23} > A$$

and truth table

$$\textcircled{1} \quad x_1 = x_2 = 0 \rightarrow S = 0$$

$$y = w_{03} < 0 \Rightarrow w_{03} = -A$$

$$\textcircled{2} \quad x_1 = 0; x_2 = 1 \rightarrow S = 0$$

$$y = w_{23} + w_{03} < 0$$

$$w_{23} < A$$

$$\textcircled{3} \quad x_1 = 1; x_2 = 0 \rightarrow S = 0$$

$$y = w_{13} + w_{03} < 0$$

$$w_{13} < A$$

$$\textcircled{4} \quad x_1 = x_2 = 1 \rightarrow S = 1$$

$$y = w_{13} + w_{23} + w_{03} > 0$$

$$w_{13} + w_{23} > A$$



\* for NAND ; NOR just multiply weights by -1

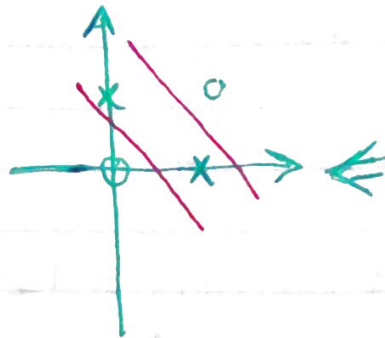
AND  $\Rightarrow w_{13} = -2, w_{23} = -2, w_{03} = 3$

NOR  $\Rightarrow w_{13} = -2, w_{23} = -2, w_{03} = 1$

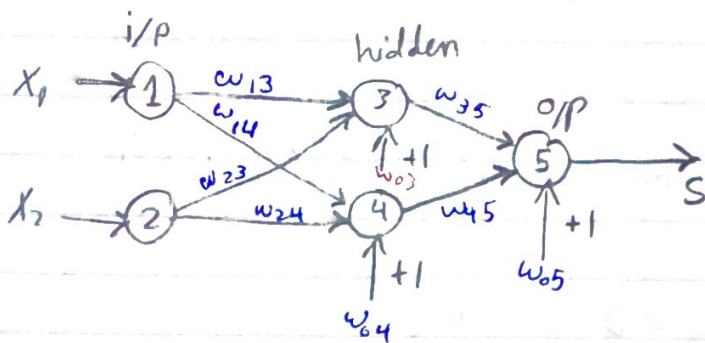
# XOR  
"non-Linear"

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XOR  $\subset w^1_s$



$x_1$	$x_2$	$S$
0	0	0
0	1	1
1	0	1
1	1	0



$w_{13} = 2, w_{24} = 2, w_{03} = -1.5, w_{23} = -1$

$w_{14} = -1, w_{35} = 2, w_{04} = -1.5, w_{45} = 2$

$w_{05} = -1.5$

$z_3 = f(y_3), z_4 = f(y_4), s = f(y_5)$

$y_3 = 2x_1 - x_2 - 1.5$

$y_4 = -x_1 + 2x_2 - 1.5$

$z_3 = f(y_3), z_4 = f(y_4)$

$y_5 = 2z_3 + 2z_4 - 1.5$

$s = f(y_5)$

$$\textcircled{1} \quad x_1 = x_2 = 0$$

$$y_3 = -1.5 \Rightarrow z_3 = 0$$

$$y_4 = -1.5 \Rightarrow z_4 = 0$$

$$y_5 = -1.5 \Rightarrow \boxed{S = 0}$$

$$\textcircled{2} \quad x_1 = 0, x_2 = 1$$

$$y_3 = -2.5 \rightarrow z_3 = 0$$

$$y_4 = 0.5 \rightarrow z_4 = 1$$

$$y_5 = 0.5 \rightarrow \boxed{S = 1}$$

$$\textcircled{3} \quad x_1 = 1, x_2 = 0$$

$$y_3 = 0.5 \rightarrow z_3 = 1$$

$$y_4 = -2.5 \Rightarrow z_4 = 0$$

$$y_5 = 0.5 \rightarrow S = 1$$

$$\textcircled{4} \quad x_1 = x_2 = 1$$

$$y_3 = -0.5 \rightarrow z_3 = 0$$

$$y_4 = -0.5 \rightarrow z_4 = 0$$

$$y_5 = -1.5 \rightarrow \boxed{S = 0}$$